PERT INSTRUCTION MANUAL AND SYSTEMS AND PROCEDURES FOR THE PROGRAM EVALUATION SYSTEM

SPECIAL PROJECTS OFFICE
BUREAU OF NAVAL WEEAPONS
DEPARTMENT OF THE NAVY

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I. INTRODUCTION

The Program Evaluation System (PERT) is a method for evaluating progress to improve the planning of a major research and development program. It is a tool for management control. Initially, the system has been developed and applied to the Fleet Ballistic Missile (FBM) Program.

The FBM program is very similar in form to any other type of plan since it is composed of a series of activities or tasks scheduled in anticipated sequence culminating in the attainment of some final major objective. Product performance and resource allocation operate as constraints on the time of accomplishment.

The problem of evaluating a research and development program is acknowledged as difficult by experienced research people because of the nature of the activities—intellectual, pioneering, and unpredictable.

How can the Program Evaluation System (PERT) improve on a day-to-day comparison of progress with planned schedule dates? Basically, the system can provide at a minimum (1) orderliness and consistency in planning and evaluating, (2) automatic identification of possible future trouble spots as a result of failure in one area, (3) speed in integrating progress evaluation, and (4) throughout these previous points, accurate portrayal of the dynamic research situation.

II. PURPOSE

1. GENERAL DESCRIPTION. The purpose of the Program Evaluation System (PERT) is to provide a means of handling the large and complex problem of rapid evaluation and reprogramming in the FBM program. The Systems and Procedures Manual provides a description of the methods used to obtain and process the required information necessary for the effective operation of the system. This manual is intended as a guide for all personnel directly concerned with operation of the system.

Sections of the manual contain information to cover the answers to the general questions: Who? What? When? Where? How? Specifically, operation of the Program Evaluation System must develop along the following lines:

(1) Select specific, identifiable events* which must occur along the planned progress toward some goal.
(2) Sequence these events and establish the relationships which exist among them.
(3) Estimate the time and a measure of the variability of this time for the activity joining each pair of events.
(4) Apply electronic data-processing equipment (computer) to process and integrate these data.
(5) Establish information flow channels to assemble progress and change data.

2. IMPORTANCE OF PROPER PROCEDURES. Efficient operation of any evaluation system is dependent upon timely receipt of accurate information. The procedures outlined herein are designed to obtain the necessary information rapidly and with minimum effort. In order to decrease the amount of work involved and minimize the problems of installation and operation, the procedures have been tailored to fit in with existing milestone progress reporting procedures wherever practicable. The effective operation of the Program Evaluation System is highly dependent on up-to-date computer inputs and rapid dissemination of the outputs to management. The capability of the NORC computer installation is utilized for processing the information. The computer can process some 10,000 activity times in less than half an hour.

*Exhibit I, on the following page, is a glossary of terms that apply to the Program Evaluation System.

EXHIBIT I

GLOSSARY
(PERT)

FBM PROGRAM EVALUATION SYSTEM

ACTIVITY

An event is separated from other events by activities. An activity is a time-consuming element in the development process. It is represented on a flow chart by an arrow. An activity cannot be started until its preceding event has been accomplished. A succeeding event to an activity cannot be accomplished until the activity is complete.

ACTIVITY TIMES

Estimates of the elapsed time necessary to complete an activity in a specified manner are activity times. They are represented by estimates indicating:

- Optimistic times
- Most likely times
- Pessimistic times

CRITICAL PATH

A critical path is that particular sequence of activities in a flow chart that comprise the most rigorous time constraint in the accomplishment of the end event.

EVALUATION TEAM

The Evaluation Team (Team) is descriptive of a group of designated individuals charged with furthering the SP evaluation effort as it bears on a given sector of the FBM development. Generally, a Team will be comprised of individuals representing the SP Technical and the SP Evaluation divisions, SP Field Office, and the Contractor.

EVENT

A meaningful specified accomplishment in the FBM development program. An event should be recognizable as a particular instant in time.

FLOW CHART OR PLAN

The sequenced diagrammatic representation of events and activities.

PRECEDING EVENT

See ACTIVITY

SLACK PATHS

Slack paths are sequences of activities that do not lie on the critical paths. Slack may exist in varying amounts.

SUCCEEDING EVENT

See ACTIVITY

III. INSTALLING THE SYSTEM

1. PRELIMINARY MEETINGS. There can be no substitute for adequate preparation of all levels of management within the contractor organization prior to beginning the actual installation. Probably the best approach to use is similar to the one frequently employed by SP management for originating milestone progress reporting procedures. Briefly, this involves briefing certain contractor personnel in PERT methodology and outlining the procedures to be used for gathering and transmitting essential data. This can be accomplished, in most cases, at the time of a visit to the contractor's plant by a well-trained team from SP with representatives from and arrangement by the SP Field Office.

The importance of the acceptance and approval of management within the contractor organization should not be underestimated. "Getting off on the right foot," goes a long way toward making an effective installation of the system.

2. ORIGINATING THE FLOW CHART—THE VISIT OF THE EVALUATION TEAM

(1) *Selecting the Events.* After the Evaluation Team has been properly set up and generally briefed and trained, a meeting with the contractor-assigned members of the team should be planned and held to select the events to be included on the flow chart. It is possible that SP milestones used in existing progress reporting after examination and necessary revision can become the events that are needed to form the basis for the flow chart.

It is important to analyze each event description considered for use on the flow chart by asking appropriate questions in the following categories:

Category 1—Does the event represent a definite discernible beginning or ending point of some activity or group of activities? (Such words as firm, finalize, freeze, ship, etc. are to be avoided. In their place use such phrases as, "design release complete," "production prototype design complete," "approve for captive test," "arrival of 1st flight test vehicle at AFMTC," etc.)

Category 2—Is the description detailed and complete? Does it tell who does it? Where and what is done? (Be sure model descriptions are complete. Use specific FTV, CTV, and other available code numbers to name specific components, sybsystems, and systems. Use test and model numbers.)

Category 3—Does the technical man who is to do the estimating understand the events as beginning and ending points of some clearly defined activity? Is he able to fix in his own mind what has to take place *at the completion* of the preceding event before the immediately succeeding event is reached? (This category is used when interrogation of the estimator takes place in obtaining time interval estimates.)

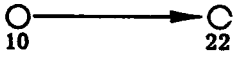
(2) *Laying Out the Chart.* After the events have been properly selected, the next step is to place the descriptions on a flow chart. This can be accomplished on a "first cut" basis by drawing a series of circles (or boxes) about 1-1/2 inches across on a large sheet of paper. The event descriptions are handwritten in the circles. (They may be abbreviated as long as a complete list of events and their description is maintained.) Events are placed vertically according to category (subcomponent on a component chart, subsystem on a system chart, etc.) and along the horizontal axis roughly according to schedule dates. It is best not to place a permanent horizontal scale on the chart. If this is done, the estimator may use the divisions to judge the planned amount of time scheduled to elapse between events and, thereby, introduce a bias into his estimates.

At the conclusion of this step in the process, the chart is nothing more than a series of circles with written descriptions in them. (For the most part, a sheet of paper about 24 by 36 inches should provide enough space for about 200 events with a 2-year scale along the horizontal axis.)

(3) *Connecting Events.* To aid in connecting events, the head of the technical group directly engaged in doing the development work under consideration should be requested to provide qualified personnel. They should be persons of a high level in the technical organization and yet should be capable of doing the development work themselves. In other words, they should be aware of the over-all planning as it applies to the area covered by the flow chart.

Technical personnel are to indicate the connections or arrows to be drawn between events according to present plans and expectations. The criterion to use is, for example:

> "According to present plans it is expected that events numbered 10 and 22 are related and that event number 10 will have to be reached before event number 22 can be accomplished. Events number 10 and 22 are so related and interdependent that unless 10 is completed the activity between them cannot be started. Furthermore, it will be impossible to reach the point in time represented by 22 until the activity represented by the arrow between them is completed. More specifically: an inspection of an assembly cannot be started until it is assembled, the assembly cannot begin until the components are fabricated, etc."



It is advantageous to start at the left of the chart where some events may have been completed already or scheduled for completion momentarily. Some events are considered as having no preceding event. These events start as of the time "0" or "now."

Arrows leading into these events originate at the "0" point. The connecting process is continued across the chart to the extreme right until each event is properly related to all the other events

either directly or indirectly. Events 1, 3, and 5 of Exhibit II, following this page, are events of this type.

The statement is sometimes made by the technical man, "But this event does not have to be accomplished before we can start the indicated subsequent activity."

The question to ask in this case is, "Does the relationship as shown by the arrow, represent current planning within your group?"

(4) *Estimating Elapsed Times.* The same technical man, if available, who indicated the connections to be made between events should be consulted to provide estimates of elapsed times and associated variabilities for the activities represented by the arrows between pairs of events. It is important that the technical man be fully aware of the actions within his group which must take place between the events. Also, he must be able to provide three time estimates corresponding to three different sets of conditions as indicated below:

1. *Optimistic Time*—The first estimate is an "optimistic" one, in that it gives the best or shortest time. There is little hope of completing the activity in less than the optimistic time.
2. *Most Likely Time*—The "most likely" time estimate is that which would be given if only one time estimate was requested. It is the time that would occur most often if the activity was repeated under *exactly* the same conditions many times. If many knowledgeable people were asked for the most likely time, the value given most often would form the most likely time estimate.
3. *Pessimistic Time*—If significantly worse luck than usual occurs, the "pessimistic time" estimate indicates the longest time that the activity would take.

Time estimates should be entered on the flow charts along the arrows to which they apply. A good form to use is illustrated in the original flow chart of Exhibit II. When all three time estimates (optimistic, most likely and pessimistic) are equal, the activity should be analyzed carefully for possible errors in estimation.

(5) *Identifying Events and Assigning Code Numbers.* In order to adequately identify events in a form amenable to computer analysis and to transmit information about events in an unclassified manner, it is necessary to assign code numbers to the various events.

The code number consists of two parts: a six-digit prefix and a three-digit suffix, separated by a hyphen. The prefix identifies the highest level chart number upon which the event appears. For example, most events on a component chart numbered 027110 would have this particular six-digit number as a prefix. However, certain important events which appear on a subsystem or system flow chart would be numbered according to the topmost chart upon which they appeared. Typically, the flow chart numbering would appear as one of the following examples:

Chart Number	*General Type*
020000	System
027000	Subsystem (may contain 020000 numbers).
027100	Component (may contain 020000 and 027000 numbers).
027110	Subcomponent (may contain 020000, 027000, and 027100 numbers).
027111	Use of the last right hand column indicates a special chart.

Note: It is possible to have a short-range system chart and number it 020001. Events on it, however, would be numbered 02000 *if* they appeared on the 02001 chart.

An index should be kept in SP probably by computer liaison, of all high level chart numbers of a general nature that are likely to appear on lower level charts, i.e., events that concern a combination of two or more systems, subsystems, etc. A flight test, for example, would probably concern ballistic shell, flight control, guidance, and propulsion, etc. When constructing a new flow chart or network, all events of a general nature should be checked with a copy of the index. When event descriptions are the same, numbering of the highest level chart must take precedence. Notice the numbering of events in Exhibit II.

The suffix consists of three digits that are assigned sequentially as the chart is drawn. Descriptions of events are noted on the flow chart according to the form and order illustrated by the following dummy.

(Begin)	Key word
(Flight Test from Flat Pad)	Complete description
(AFMTC)	Location, if necessary
(Propulsion s/s)	Identification
(CX-1)	Identification
(16)	Prefix or sequence number

After all the events have been placed on the chart, suffix numbers are assigned: 001 to the first event picked (not in any prescribed order), 002 to the second, 003 to the third, etc. It is best to keep an index of these events. The above example would appear as follows:

INDEX

Code Number	*Other Identification Number* (If Any)*	*Description*	*Responsibility*	*Schedule Date*
027100-001		Begin Flight Test from Flat Pad, AFMTC Propulsion s/s, CX-1	LMSD	(---)

*Any other number, such as chart and line number of a PMP which should be retained.

(6) *Completing the Chart.* The flow chart is to be used as the basis for conveying the initial data to Sp 12. In its original "work sheet" form, it must be classified because of the event description. If the chart is redrawn with no time scale or dates shown and the identification code numbers are placed in the event boxes instead of the descriptions, the chart can be transmitted unclassified. However, an event index list is required in addition to the flow chart to explain the meaning of each code number.

3. TRANSMITTING INFORMATION

(1) *Using Flow Charts To Convey Information.* The chart should be redrawn so that it is readily reproducible. If placed on tracing paper with India ink lines, it can be reproduced by the Ozalid process. Original charts and reproducible masters should be kept by the contractor member of the Program Evaluation Team and copies submitted through the SP Field Office as per the data flow chart in Exhibit III, following this page.

(2) *Translating the Flow Chart to a Standard Progress Form.* Information as presented on the flow chart cannot be fed directly into the computer. At some point in transmission, the flow chart has to be converted into numerical data. Each activity time and its corresponding boundary events are translated into entries on the Report of Progress and Time Interval Estimates Form illustrated in Exhibit IV, following Exhibit III. The conversion should take place in the data flow process as soon as possible after the origination of the chart. A logical place for this routine clerical operation would be in the SP Field Office or in the contractor's program plans or program analysis group. The decision as to who does this will be made by the Sp 12 representative at the time of installation. Required copies of the completed forms are to be forwarded to SP for distribution and analysis as indicated in Exhibit III.

(3)* *Coding the Standard Progress Form.* Certain sections of the Report of Progress and Time Interval Estimates Form are reserved for the coding section of the Computer Center or other authorized groups. Entries in column (1) must be made as follows:

Reason for Line Entry on Form	*Code Number*
New or original estimate of an activity (adding a connecting link)	1
Re-estimate of existing activity	2
Completed activity	3
Static change—correction by computer staff	4
Deletion of an activity	5

Columns (2) and (3) are specifically set aside for SP, FBM managers. Special computer runs can be made when requested. In order to code computer runs, entries in these two columns will be supplied by the individuals within SP Technical Branch or the SP Field Office that originates the request for a special run. These entries will reflect any hypothetical or proposed changes in resources (column 2) and/or performance (column 3). Entries should be in the form of 3 digits representing per cent of performance or resource allocation. Dropping performance to 50% of original plans would be indicated by an 050 entry; similarly resource allocation of 500% (5 times original plans) would be shown by a 500 entry.

Column (4) is provided for the computer staff. Entries here translate a calendar date from column (G) into a code number understandable by the computer. Tables will be provided the computer clerical staff so that they can make the conversions.

4. HANDLING OF ORIGINAL DATA

(1) *Revising the Original Flow Chart Drawing.* Computer analysis of the original data will determine for each event an earliest time or a time when the event is expected to occur. After this is done, revised flow charts will be drawn by Sp 12 Graphics using earliest times for determining the positions of various events along the horizontal axis. Copies of these revised original charts will be transmitted to the cognizant SP Technical Branch and to the estimator making the estimates. Any necessary changes or corrections must be submitted to Sp 12 Computer Center on the chart or on the proper form Exhibit V, following this page.

*Leave this section out of manuals intended for use solely by contractor personnel.

If there are corrections or changes to be made, Sp 12 Graphics will revise the chart and notify the original team of the changes (see Exhibit III).

IV. MAINTAINING THE DATA FLOW

1. GENERATING THE BIWEEKLY REPORT. The form used with its attendant instructions is described in Exhibit VI, following this page. Transmission of the form is outlined in Exhibit VII, following:

2. REQUESTING ADDITIONAL INFORMATION ON CRITICAL AREAS. As a result of computer analysis, specific paths on the flow chart will show up as critical. At the end of each monthly period, the contractor will be required to submit re-estimates of all time intervals along the critical path. The requests will be handled as set forth in the data flow diagrams of Exhibit VIII, following, and will require either completion of a form similar to that illustrated in Exhibit V or a revision of a flow chart as provided by Sp 12. Requests from SP 12 may originate on the form mentioned, in which case, it will be necessary for contractor personnel to finish the entry for each partially completed line and return the report to the Computer Center. Outputs will be distributed as illustrated in the data flow chart, Exhibit VIII.

3. FULFILLING "SPECIAL" REQUESTS FOR SUPPLEMENTARY DATA. A "special" request for supplementary data may originate at any time as a result of endeavors by SP Technical Management to develop new or revised plans and schedules. The method to follow in originating and transmitting these requests is outlined in the data flow diagram of Exhibit VIII.

The process begins with the SP Technical Branch and the SP Field Office writing up the request on a standard form (Exhibit V) and submitting this to Sp 12. If more information is required on the form from the contractor, the partially completed form is transmitted as shown in Exhibit VIII. Outputs generated as a result of such hypothetical or proposed changes are returned to the requesting body.

4. REVISING EXISTING FLOW CHARTS QUARTERLY. Essentially the same procedure is followed in revising flow charts quarterly as is used in setting them up originally. A team of representatives as described in Section III critically examines all events and times in the existing flow chart. Revisions and re-estimates are made wherever necessary. All changes are communicated as outlined in the flow chart of Exhibit III and are incorporated as soon as available to Sp 12 in subsequent computer runs.

V. UTILIZING OUTPUTS FOR MANAGEMENT DECISION MAKING

1. INTERPRETING AND ANALYZING OUTPUTS. The output sheets as illustrated in Exhibit IX, following this page, provide valuable information as to progress to date and anticipated future progress. The $T_L - T_E$ column indicates the amount of slack in a particular event. The presence of a large amount of positive slack in an event is an indication of a place where resources might be available for possible "trade-offs." A slack value approaching zero would indicate that the event in question is likely to be a potential trouble spot. Critical paths are determined by highlighting (drawing in red or otherwise emphasizing) those lines which pass through events with zero slack. Slippage of an event along the zero slack path will cause a corresponding slip in some major end objective.

Monthly requests for additional data are an attempt to focus attention on relatively critical paths and to audit a few specified events. Re-estimates are requested for all those times that lie along the critical paths. This serves two purposes: (1) emphasis is placed on "tight" areas, and (2) estimates in these areas are marked for critical analysis with an effort to produce more accurate data where it is needed most.

Auditing seeks to improve the accuracy of the flow chart by requesting estimates on a small group of selected activities which differ from month to month. It is expected that all events on the chart will be covered at one time or another.

The T_S column is merely a conversion of the schedule data for an event to the coded date as utilized by the computer. The P_r column is the result obtained by comparing on a probability basis the expected or earliest time (T_E) for the occurrence of an event with the schedule time (T_S). The number in the P_r column indicates the probability of reaching the event on or ahead of schedule. Obviously, if the P_r value is low (below .05), the probability of meeting or beating the schedule is quite remote. Values of about 0.5 are good, while values close to 1.0 are excellent.

2. DEVELOPING NEW OR REVISED PLANS As a result of examining initial outputs on a particular component or subsystem, the Technical Branch of SP may decide to develop and to test hypothetical plans. Those events that are marked as probably being reached ahead of schedule indicate possible areas where resource trade-offs might be arranged. Events along the critical (zero slack) path indicate possible areas for performance degradation or increased resource application.

If the schedule for a major event is in jeopardy, it may be possible to replan in a fashion that will improve the outlook of meeting schedule. This replanning could take the form of altering the planned sequence of events, if that is possible. Such an alteration could postpone certain activities to a later point in time. E.g., it might be possible in certain situations to forego some testing before a flight. Thus the replanning would not force the flight to await all of the preliminary tests that were originally planned.

In addition to the changes already mentioned, it is possible to set up the computer so that it will develop a new schedule based on some arbitrary set of criteria. This is described in detail in the Phase I report of the PERT project—available from Sp 12.

Changes like those above can be indicated on a form of the type presented in Exhibit IV, and the computer will make the analysis within a few hours after the origination of the request. The speed with which the computer operates allows may hypothetical situations to be posed and tested in a short period of time. The difficult part of the process is the translation of the physical situation envisioned

in the mind of the planner into the objective terms which form the language of the computer. There can be nothing hazy or indefinite about the information or instructions that are fed into the computer if accurate and reliable results are to be obtained. A computer liaison man will be available in Sp 12 for consultation on problems of computer interpretation.

EXHIBIT II–1

ORIGINAL FLOW CHART (DUMMY)

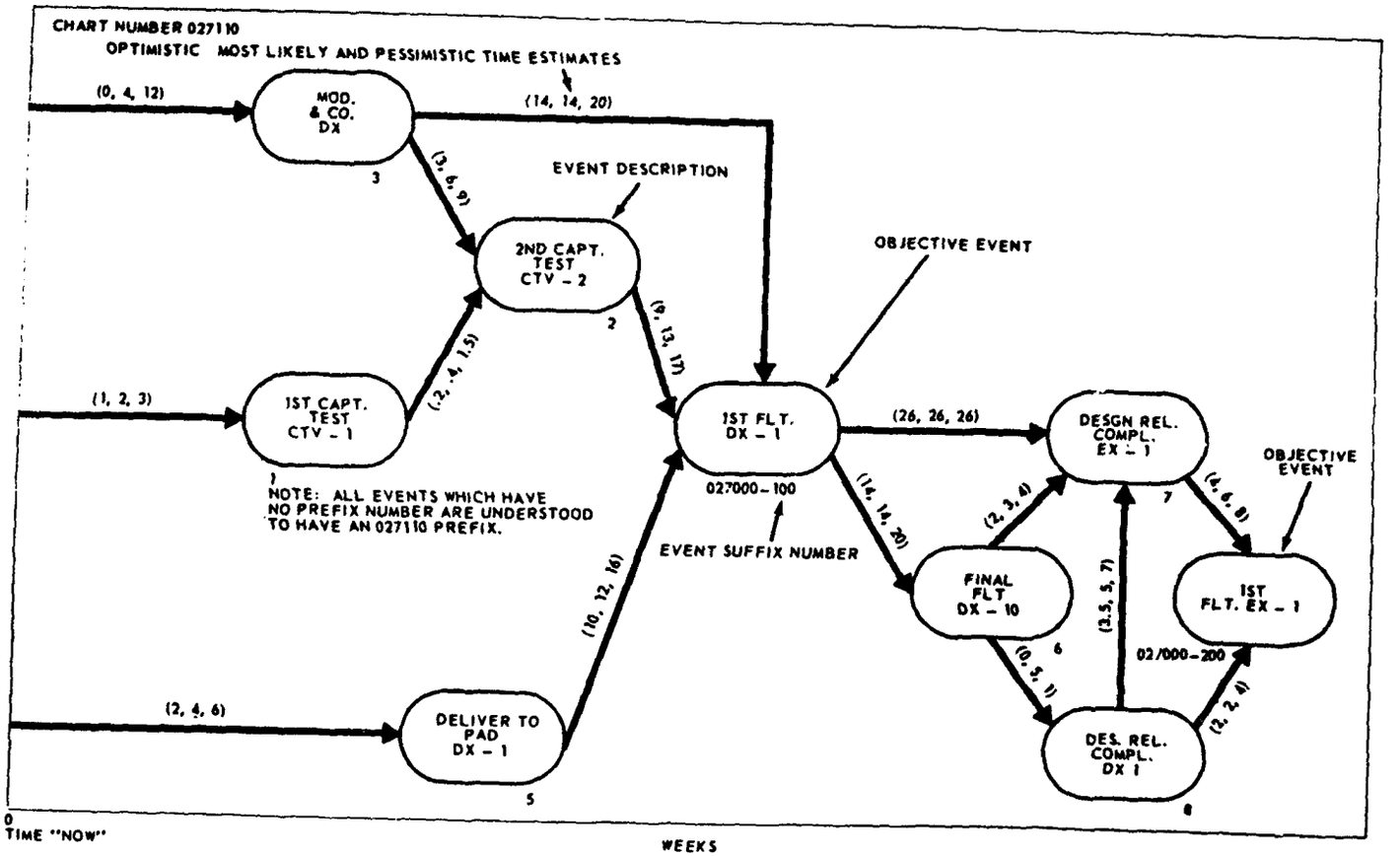


EXHIBIT II-2

RE-DRAWN FLOW CHART
(DUMMY)

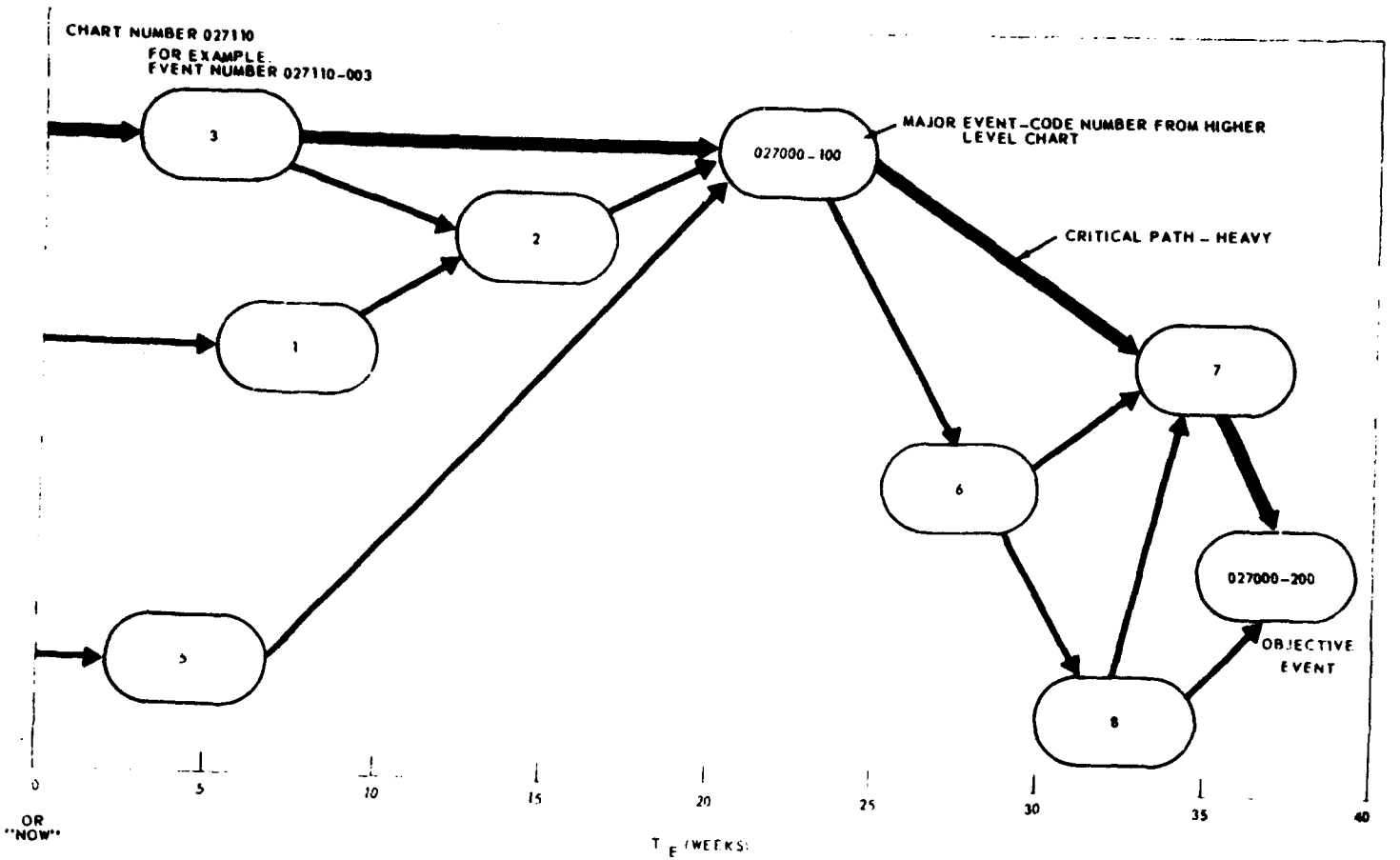
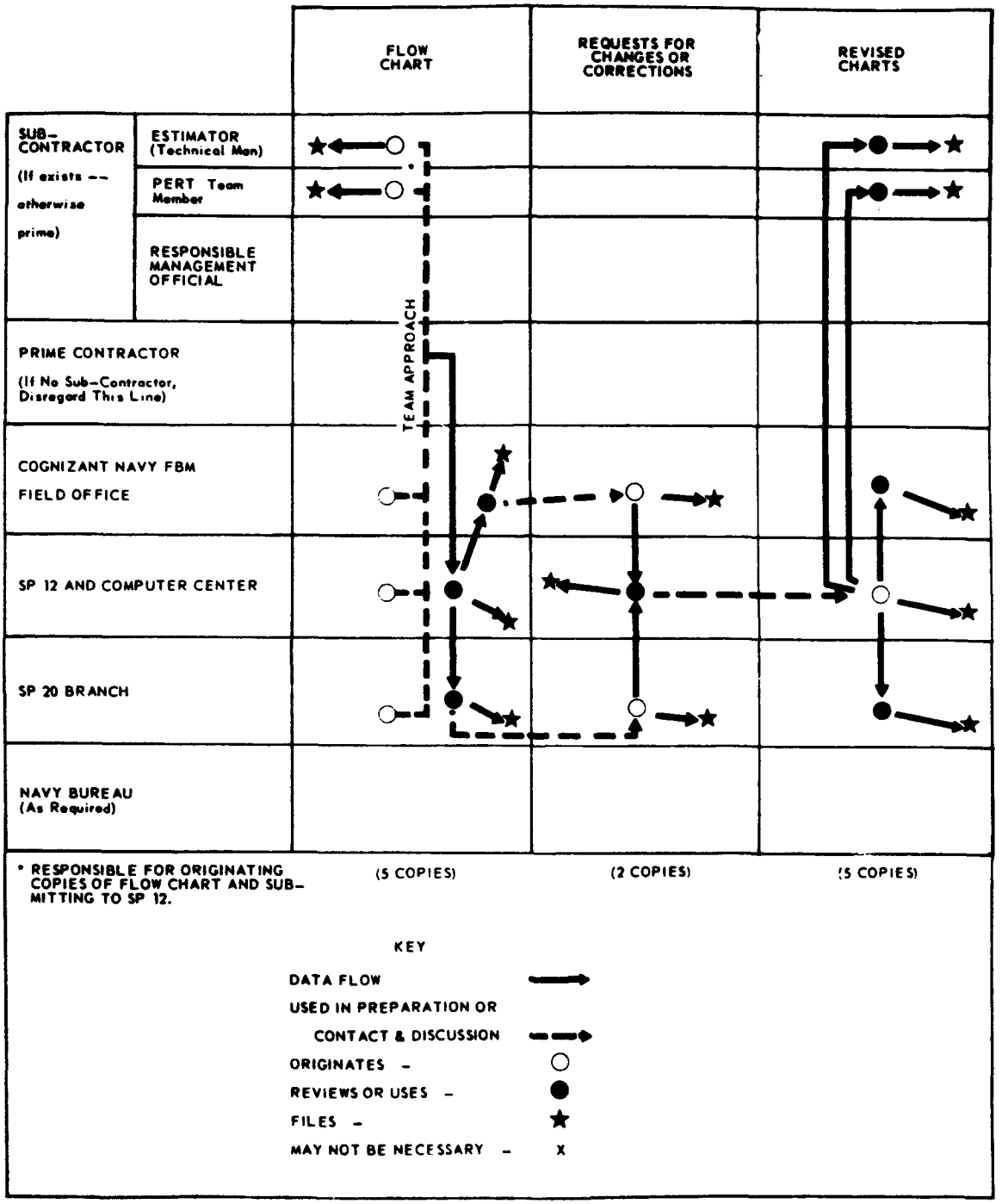


EXHIBIT III

DATA FLOW DIAGRAM - PERT
ORIGINATING AND REVISING FLOW CHARTS



* RESPONSIBLE FOR ORIGINATING COPIES OF FLOW CHART AND SUBMITTING TO SP 12.

EXHIBIT IV

(PERT)
REPORT OF PROGRESS & TIME INTERVAL ESTIMATES

DUMMY

CLASSIFICATION (WHEN FILLED IN)

FROM: (NAME & LOCATION OF CONTRACTOR)	TO:	CONTRACT NO.	REPORT PERIOD FROM/TO
SP 12	COMPUTER CENTER	---	---

FOR OFFICE USE ONLY (DO NOT FILL IN)			EVENT IDENTIFICATION NO.		TIME INT. EST.			COMPLE-TION DATE	DO NOT FILL IN	REMARKS
			PRECEDING	SUCCEEDING	OPT. (WKS)	MOST LKLY (WKS)	PESS (WKS)			
(1)	(2)	(3)	(B)	(C)	(D)	(E)	(F)	(G)	(4)	(H)
4	200	50	027100-296	027100-340	2	6	12	(NOT NEEDED)	(NOT USED)	Effect of Proposed Changes on Entire Program
4	200	50	027100-297	027100-339	6	7	8			
4	200	50	027100-298	027100-323	12	26	32			
				(ETC.)						

SIGNATURE AND TITLE OF RESPONSIBLE OFFICIAL — DATE SIGNED

CLASSIFICATION (WHEN FILLED IN)

EXHIBIT V

(PERT)
REPORT OF PROGRESS & TIME INTERVAL ESTIMATES

DUMMY

CLASSIFICATION (WHEN FILLED IN)

FROM: (NAME & LOCATION OF CONTRACTOR)	TO:	CONTRACT NO	REPORT PERIOD FROM/TO
LMSD, SUNNYVALE, CALIFORNIA	SP 12	(INSERT CONTRACT NO.)	9/16 TO 9/30

FOR OFFICE USE ONLY (DO NOT FILL IN)			EVENT IDENTIFICATION NO.		TIME INT. EST.			COMPLE-TION DATE	DO NOT FILL IN	REMARKS
			PRECEDING	SUCCEEDING	OPT. (WKS)	MOST LKLY (WKS)	PESS (WKS)			
(1)	(2)	(3)	(B)	(C)	(D)	(E)	(F)	(G)	(4)	(H)
3			"0"*	027110-001				9/22	12.6**	Completed event
2			027110-003	027110-005	6	8	9			Re-estimate because of change in plans
5			027110-002	027110-004						
5			027110-004	027110-005						Event # 027110-004 deleted
1			027110-002	027110-196	3	9	12			
1			027110-196	027110-005	4.5	6.5	8			Event # 027110-196 added – schedule date: 2/59

SIGNATURE AND TITLE OF RESPONSIBLE OFFICIAL — DATE SIGNED

* No predecessor

** Filled in by Sp 12 or Computer Personnel

CLASSIFICATION (WHEN FILLED IN)

EXHIBIT VI

(PERT)
REPORT OF PROGRESS & TIME INTERVAL ESTIMATES

DUMMY

CLASSIFICATION (WHEN FILLED IN)

FROM: (NAME & LOCATION OF CONTRACTOR)	TO:	CONTRACT NO.	REPORT PERIOD FROM/TO
LMSD – SUNNYVALE CALIFORNIA	SP 12	(INSERT CONTRACT NO.)	- - -

FOR OFFICE USE ONLY (DO NOT FILL IN)			EVENT IDENTIFICATION NO.		TIME INT. EST.			COMPLE-TION DATE	DO NOT FILL IN	REMARKS
			PRECEDING	SUCCEEDING	OPT. (WKS)	MOST LKLY (WKS)	PESS. (WKS)			
(1)	(2)	(3)	(B)	(C)	(D)	(E)	(F)	(G)	(4)	(H)
1*			027110–001	027110–002	.1**	.5	1	9/58***		
1			NOW OR "0"	027110–003	10	12	16	12/58		
1			027110–002	027110–004	.2	.8	1.2	10/58		
1			027110–004	027110–005	12	16	22	2/59		
1			027110–003	027110–005	3	4	5	2/59		
1			027110–005	02700–100	.2	.2	1	1/59		(Notice use of 02700 numbers indicating general high level, type of event)
1			02700–100	027110–006	3	3	3	3/15/59		
1			027110–009	027110–010	5	5	10	5/59		

SIGNATURE AND TITLE OF RESPONSIBLE OFFICIAL — DATE SIGNED

* Filled in by other than Contractor Personnel
** Column (D), (E), (F) and (G) filled out by Contractor
*** A date given as a month and a year will be considered as equal to the last day of that month.

CLASSIFICATION (WHEN FILLED IN)

EXHIBIT VII

DATA FLOW DIAGRAM - PERT
TRANSMITTING BIWEEKLY REPORTS

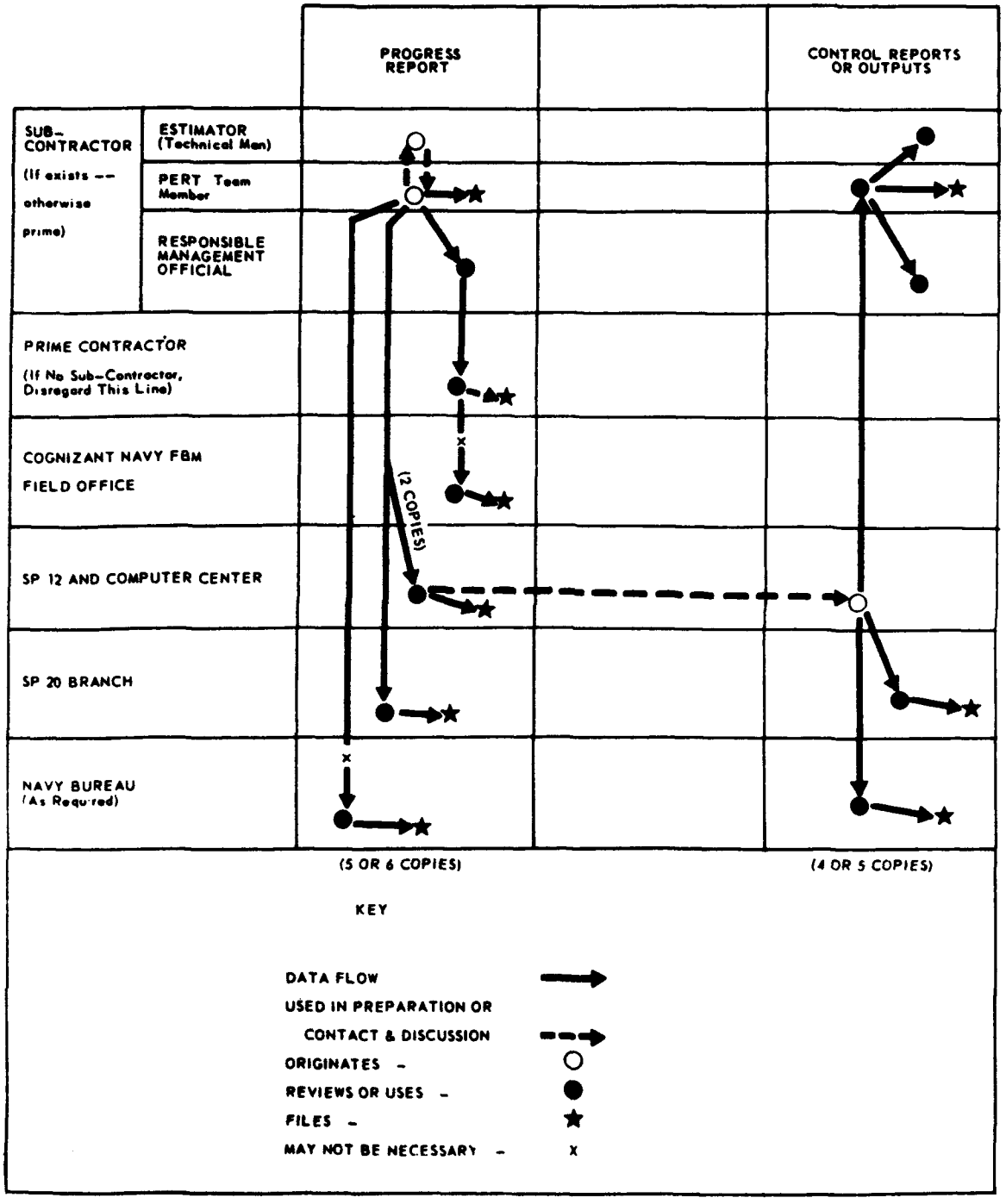


EXHIBIT VIII

DATA FLOW DIAGRAM - PERT
REQUESTING ADDITIONAL INFORMATION

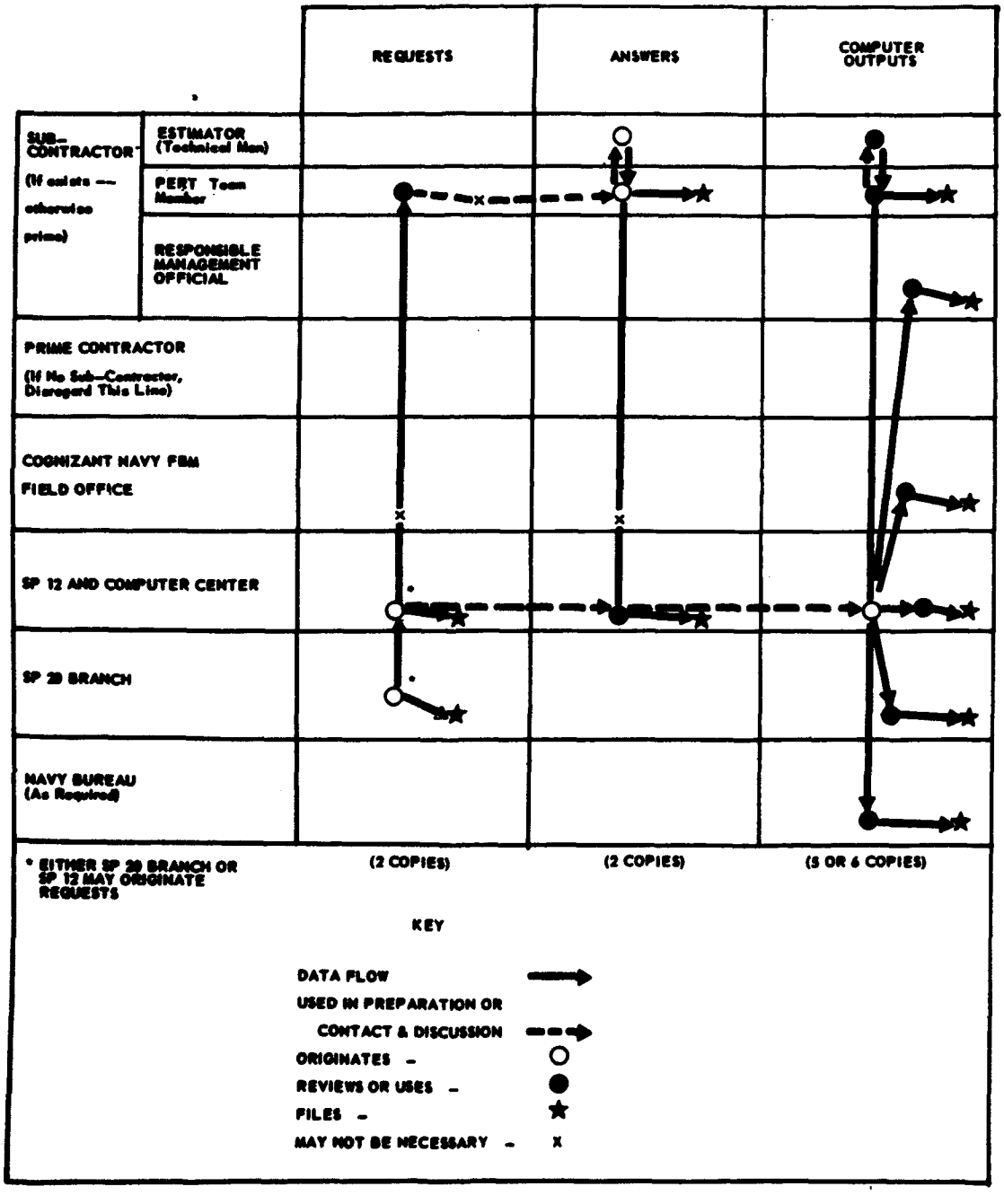


EXHIBIT IX

PERT SYSTEM

Biweekly Report Output

DATE 9|16|58 WEEK 11.8 PAGE ___

EVENT	T_e	T_l	$T_l - T_e$	T_s	P_r	Scheduled Date
027110-001	1.1	1.1	0	1.5	.65	9/26/58
027110-004	4.3	5.6	1.3	6.0	1.00-	10/58
027110-005	29.3	29.3	0	25.0	.00+	2/59
027110-196	30.7	32.9	2.2	25.0	.00+	2/59

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